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Fabrication of Automatic Drilling & Tapping Machine

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Abstract: ***This paper focuses on fabrication aspects of automatic drilling & tapping machine and it describe the various components of the machine. This paper also focusses on working of automatic drilling & tapping. Our machine also suitable with the economical mass production with increased the productivity and accuracy. This is done by reducing the set up cost and manual fatigue. This machine is capable of performing both drilling and tapping operation with the help for speed reduction gear box. As drilling requires high RPM and tapping requires low RPM to perform the drill and internal threads operation. We know that for tapping we need to rotate the spindle in both direction so we use bevel gear arrangement for reversal of the spindle and also worm and worm gear is used for speed reduction as drilling requires high RPM and tapping requires low RPM to perform the drill and internal threads.***
Keywords: Drilling, tapping & automation

I. INTRODUCTION

Automation is the need of the hour which improves production, reduces time for manufacturing them and helps to manufacture economically on a mass scale. Drilling & tapping is one of the important manufacturing processes which need to be automated. In conventional drilling process which is the most common way to originating a hole in metal or other materials, for precise hole location, good finish and accurate size.

A. Automation

An automation is one which a process is performed by a machine without the direct participation of a human worker. Automation is implemented using a program of instructions combined with a control system that executes the instruction.

B. Drilling Process

The drilling machine is one of the most important machine tools. In a drilling machine hole may be drilled quickly. The holes are generated by the rotating edge of a cutting tool known as the drill which exerts large force on the work clamped on the table. As the machine exerts vertical pressure to originate a hole it is also called as a “Drill Press”.

C. Tapping Process

Tapping is the operation of cutting internal threads in a hole using a cutting tool called Tap. A tap has cutting edges in the shape of threads. When the tap is screwed into a hole it removes metal and cuts internal threads for tapping the hole drilled will be smaller than the tap size.
Tap drill size = 0.8 * Outer diameter of the threads

II. CONSTRUCTION

1) *Base:* The Base is that part of the machine on which the vertical column is mounted. The Base is made of Cast Iron. It serves as a foundation member for all other parts which rests upon it. It carries the column at one end and the motor Bracket on the other end.
2) *Column:* The column is the vertical member of the machine, which supports the table and the head containing all the driving mechanism. The Column should sufficiently, rigid so that it can take up the entire cutting pressure. The column is made as a round section. This Column mounted on the base with the help of column support.
3) *Table:* The Table is mounted on the column and is provided with ‘T’ bolts for clamping the work directly on its face. The table is made as a rectangular in shape. the table moves up and down over the column of the machine. The top of the table is machined and is used for holding work pieces. It is made of Cast Iron.

4) *Cone Housing:* It is mounted on the top of the column. It consists of a lower arm and an upper arm. The two Gunmetal bushes in the arms are used as support to the Vertical Spindle. The Taper Roller Bearings in the Housing acts as support for the main driver shaft.
5) *Table Housing:* The Table Housing slides over the Column of the Machine. The up and down movements of the Table is given by Rack & Pinion Mechanism.
6) *Main Vertical Spindle:* The Spindle is mounted vertically, held between bushes and its carries two M. S. Cones one end of the spindle is attached to the drill Chuck to hold the tool. The spindle rotates in the either direction according to the engagement of Cones.
7) *Motor Mounting Brackets:* It is attached to Base with the help of Bolts and Nuts. The Motor is held in the Brackets. It is made up of Mild Steel.
8) *Motor:* It is a 3 Phase 0.5 H.P. Motor and runs at 720 rpm & is mounted on the bracket.
9) *Pulleys:* The machine has step cone pulleys of A-type. The pulleys are made up of Cast Iron. There are two similar step cone pulleys of which one is attached to motor and other is attached to the main Drive Shaft.
10) *Bearing:* Two taper roller bearings are used to support the Shaft. Axial movement of the bearing is arrested by means of collar nuts and bolts. This bearing is arrested by means of collar nuts and bolts. This bearing is used to take both axial load and thrust load.
11) *Bolts & Nuts:* It is used to fix the motor with Base, to fix the column support to the base. The Grub screw to fasten the M.S. Cones to the vertical Spindle.
12) *V-Belts:* A single V-Belt of A-Type cross section is used. It is used to transmit the power from Motor Pulley to Spindle Pulley.
13) *Rack & Pinion:* The function of a rack and pinion is to transform circular motion to rectilinear motion, Small gears are called Pinions and Racks are a series of teeth on a straight line.
14) *Cones (Fiber & M.S.):* There are 3 Cones. One Fiber cone is attached to main Shaft and two Mild Cones, which are attached to the main Spindle.
15) *Gunmetal Bush:* The bush is made up of Gunmetal; it is attached with the main spindle. It is used to arrest the movement of the spindle. There are 2 Bushes, which are provided on side of the main spindle in the upper arm and the lower arm.
16) *Main Drive Shaft:* It is made of Mild Steel. It gets the drive from the motor through the V-Belts. The pulleys are attached to one end of the main shaft and fiber cone is attached to the another end of the main Shaft. It is also called Cone Shaft.
17) *Drill Chuck:* The self-cantering 3 jaw chuck is particularly adapted for holding tools having straight shanks. The chuck is tightened and loosened by rotating a bevel key meshed with bevel teeth of the sleeve.
18) *Stop Screw:* The Stop Screw is attached to the table housing. By adjusting the Stop screw the depth of the screw would be fixed.
19) *Column Support:* The Column is mounted on the Base with the help of Column support. This Column support is made up of Cast Iron. Four holes are drilled radically so as to fasten it to the Base.

III. WORKING

The Drive mechanism of this machine is illustrated in fig.1. As the motor is switched on, the motor shaft starts revolving & hence, the V-pulley mounted over it. This, through the V-belt, transmits motion and power to the other V-pulley mounted over the Drill spindle.Thus,spindle starts rotating and therefore, the cutting tool(drill). When the drill is required to be fed into the work, it is pressed against the work by means of Feed Handle. Different spindle speed can be obtained by shifting the V-belt to different pairs of driving and driven pulleys, while the motor continues to rotate on the same speed. However, normally there is no arrangement for automatic feed on this machine. On the other hand, the tapping with reversing mechanism is provided. In this mechanism the pulley power transmission is disconnected with the help of sleeve (locking arrangement). In this the power is transmitted from motor shaft to the main shaft with help of worm and worm gear & bevel gear arrangement. Thus, the RPM of the main shaft is reduced with the help of worm and worm gear arrangement (From 1320 rpm to 90 rpm).

IV. ADVANTAGES

1) Minimise the number of components, so the maintenance of the machine is easier.
2) No skilled operators are required.
3) Good for economical mass production.
4) The machine is less expensive.
5) Less space is required.
6) Increases accuracy & efficiency of operations.

V. CONCLUSION

Our attempt through this machine is to improves the accuracy & preciseness of drilling and tapping operations. Our machine also reduces the lead time during manufacturing and economical for the mass production. As we know the drilling & taping operations are very common in mechanical work and this need to be automated for continues and efficient drilling & tapping machine.

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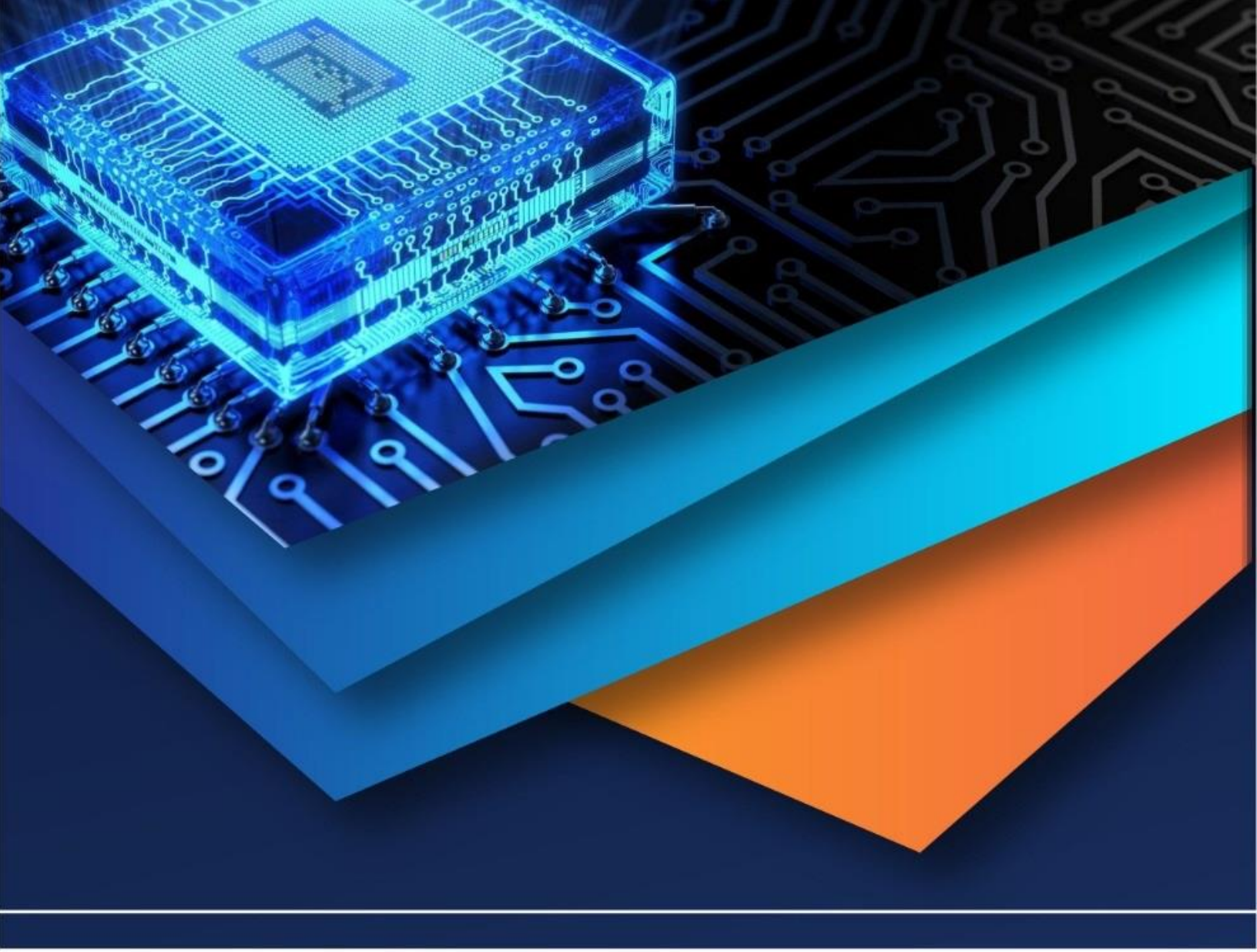

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